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ABSTRACT

This paper presents an overview of administrative applications of computers and how they function to help teachers develop the ability to discriminate between well- and poorly-designed methods of using computers to solve administrative problems or accomplish administrative tasks. The administrative applications presented include school financial activities, student information, personnel information, and other management information. Eight problem situations are described as the basis for study activities in administrative uses of computers. Appendix A contains an outline of administrative computer applications in schools, and a list of 25 references in Appendix B. This is one of a series of papers prepared as resources for preservice and inservice training of teachers. (CHV)

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The Illinois Series on Educational Application of Computers

A TEACHER'S INTRODUCTION TO ADMINISTRATIVE USES OF COMPUTERS

by

Madeline Baum

edited by

J.Richard Dennis

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To the reader,

This is one of a series of documents prepared as resources for the preservice and inservice training of teachers. The general theme of all items in this series is "teaching with or about computers". The booklets are the collective work of a variety of staff and students (both present and former) of the College of Education, University of Illinois at Urbana-Champaign. The project generously was supported between 1977 and 1979 by a grant from the EXXON Education Foundation. All responsibility for the content of these documents rests with the authors and does not reflect necessarily the views of the EXXON Foundation. It was my extreme pleasure to direct this effort throughout.

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ADMINISTRATIVE USES OF COMPUTERS

The purpose of this paper is not to make you an expert on administrative applications of computers but to give you a general idea of what these applications usually consist and how they function. The objectives are to sufficiently familiarize you with the applications so that you can follow discussions of them and to build in you some ability to discriminate between well- and poorly-designed methods of using computers to solve administrative problems or to accomplish administrative tasks.

There are many ways in which the running of a school resembles the running of a business: staff must be paid, money must be kept track of (both coming and going), and the activities of staff and products (in the case of a school, teacher and student "learning experiences") must be monitored and directed. These are things that all businesses must do and only the details (how people are paid, what the product is and how it is measured, who receives the product, how it is paid for, etc) differ from one business to another or from a business to a school. For this reason, most of the rules that apply to business data processing also apply to administrative computing in schools: information should flow as smoothly and as efficiently as possible (both to the computer and through it), information should reappear in the forms most useful and comprehensible to those ultimately who receive it and use it, and due consideration should be given to the rights and feelings of the people about whom information is used and manipulated.

Many people divide administrative applications of computers into three basic types or areas: 1) financial accounting, 2) student information, 3) personnel information. These areas overlap and blur at the edges quite a bit but it is useful to know that almost all uses of computers in school management can be grouped under one or more of these headings. The few remaining ones fall into a "miscellaneous" category of management activities.

School Financial Activities

To illustrate financial accounting in a school district, let's follow a dollar as it moves through the system. It starts out as one of several in Jane Morgan's pay (she works on the assembly line at the local General Engines plant) that are retained by federal, state or local government as part of her taxes. From there it moves through the government agencies assigned to deal with it and comes to the school which has been

chosen to receive it, along with a number of other dollars. By the time it reaches the school, its general destination and use already have been planned. This plan (the budget) was made previously and the system of allotments it contains often are based on quite complex calculations and considerations; many of them in some ways influenced by laws and many of them politically determined. The budget generally consists of a list of "accounts" or money pools and it is understood that certain expenditures are to be taken from certain accounts. In fact, each conceivable expenditure is associated with a particular account. For example, chalkboard erasers must be purchased with money from a classroom supplies account, new basketballs with money from the physical education department's equipment account, and so on. It is common for some accounts to run out of money quickly and others more slowly. This is why, for example, there may be no money in the maintenance account to replace a broken window in May, while at the same time enough money exists in the textbook account to buy 2000 new Math books. The capability of moving money around from the "rich" account to the "poor" one usually is limited, since this would defeat the purpose of having a budget in the first place. As a result, administrators must become adept at redefining expenditures so that they can be paid for by accounts other than those to which they normally would be assigned. This practice offsets a budget's normal rigidity and finds funding for things people feel need to be purchased or done but which were not foreseen when the budget was made.

Let's say that our sample dollar landed in the payroll account, usually the largest of all budget areas in a school. There usually are several accounts that make up the payroll, divided up according to whom is being paid (e.g. teaching or non-teaching staff), what they're being paid for (e.g. regular working hours or sick pay), etc. This particular dollar ended up in the sick pay account and sometime in January, when it seemed everyone was becoming ill, it went into the paycheck of Georgeanne Hirsch, secretary to the pricipal, who was down with the flu for two days. Even now the dollar is not necessarily safely out of the school district for if it ends up in the part of Georgeanne's wages that are deducted as taxes, the cycle will begin again.

All the way along, the movement of our dollar must be monitored. When it arrives, its source (state funds, federal funds, etc) and its destination (payroll) must be recorded. When it is spent, it must be subtracted from the money remaining in the payroll's sick pay account and the fact that it is paid to Georgeanne must be noted so that at the end of the year she can be given a correct report to submit with her income tax return and so that the school can supply the state and federal governments with an accurate account of how its money was spent.

The recording, keeping, and eventual reporting of this information can be, and often is, done largely or entirely by a computer. Here is a typical method for doing it: when the dollar enters as part of a check from ta government agency and the check is deposited in the school's bank account, its amount plus other information is punched on a card and fed into the computer. The computer has been programmed to divide the sum into various accounts within the budget areas. When the time comes to spend it, the account it resides in is reduced by the amount of Georgeanne Hirsch's paycheck and the paycheck itself is printed by the computer. Georgeanne cashes the check and the dollar passes from the school's bank account into Georgeanne's wallet or into her own bank account. The reason for its removal from the payroll account is recorded so that later on, its progress can be traced and the information given to interested parties (the Internal Revenue Service, the school board, the state government, etc).

Student Information

To illustrate a student information system, let's imagine a hypothetical student, Allan Allen. He is an incoming freshman at East Cupcake High School this year. By the time he first sets foot in the building, there already is a file of information on him in the principal's or guidance counselor's office. To begin with, this file contains "vital statistics" such as name, address, birth date and place of birth, parent or guardian's name, and perhaps test scores and other information gathered about Allan during junior high and elementary school. As he progresses through East Cupcake High, Allan will generate quite a bit of new information about himself. He will have absences that need to be recorded, he will earn grades that must be kept, he will take various tests the results of which will need to be noted, etc. His file will grow in size and the information in it will be referred to many times as the years go by, both before and after Allan graduates. Absences for a term will appear on report cards, grade point averages will be computed and transcripts will be produced to name only a few of the most important ways Allan's file will be used. This kind of situation, where considerable information about a group of people needs to be maintained and will be accessed many times in a number of different ways is an ideal computer application. The students' files can make up a computerized data base that is designed so that the different types of information stored can be retrieved in as many useful forms as possible. For example, let's say Allan is ill one day. His homeroom teacher sends his name to the attendance office, where a secretary types Allan's identification number into a computer terminal. The computer adds one to its total absences for Allan for this term and stores his ID number until the end of the morning when it prints a list of all students who are absent

along with any other desirable information, such as each student's total absences for the term so far (this allows checking for students with abnormally numerous absences). Another example of information storage and retrieval is grade cards. Allan's teachers submit grades for him in each of his courses at the end of the term. These are either recorded on computer cards or entered via a terminal and stored as part of Allan's permanent school record. At the same time, a grade card is printed for him. Obviously, transcripts can be printed the same way anytime one is needed.

Personnel Information

Personnel information is managed in much the same way as student information, though the nature of the data kept is somewhat different. On magnetic disc or tape will be an "employee master file" containing such items as name, address and taxation information (how much to deduct for what) for every employee. Academic personnel may well have in their files such things as college attended and major subjects, number of years teaching, subjects taught, number of years in the school, and so on. The amount and nature of the data maintained is limited only by the administration's needs, the storage available,, the employees' willingness to share information about themselves, or laws regulating personal information.

The keeping of personnel data requires maintaining a very careful balance between information access and information security. More and more, the type of personnel information that can be kept and the designation of the proper uses of such information have been the subject of legislation. Authorized users of personal information must be able to get at the information quickly and in a variety of forms. Unauthorized access, even achieved accidentally, must be prevented as much as possible.

Other Management Information

Under the "miscellaneous" heading for administrative computer use come such diverse applications as class scheduling, bus route planning, library catalogue keeping, and many others. Class scheduling, which is a very difficult and time-consuming task, involves coordinating teachers with courses with students with classrooms so that no two teachers are scheduled to teach two different classes in the same room, or no students are scheduled for two simultaneous classes. By permitting the computer to do part of the work (usually a person puts together the bare bones of

the class schedule, the computer fills the gaps, and then slight changes are made to minimize the number of conflicts), a great deal of time can be saved. Bus route planning is done by programming the computer to coordinate students' and drivers' addresses, a map of the city, and the number of available buses to create the most efficient routes and schedules. One school district saved over $50,000 by implementing such a system, since they found they could get along just as well using several fewer buses. Computer use in the school library is another ideal data base application. In addition to, or instead of, a card catalogue, the library can have a computerized catalogue that has all the necessary information about each book including whether it is in use, who has it, when it is due, its normal shelf location, etc. This eliminates much of the paperwork in library management and, properly designed, greatly can facilitate library use.

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Each of the above applications has been implemented somewhere but they are only a few of the numerous possible administrative uses of computers in schools. Many schools still use the computer only for a few of the most tedious clerical jobs, such as schedule planning and report cards. Others have computerized large parts of their administrative activities. As a general rule, the larger a school or school district, the more likely it is to have its administrative work done by a computer, largely because the sheer volume of work to be done means the computer can make possible a larger savings in time and effort. In a very small school or district, the computer may not be able to do things sufficiently faster than the manual method to justify the expense and upheaval involved in changing to an automated system. As in business data processing, a cardinal rule applies: just because something can be computerized doesn't mean it should be. The decision to assign a given task to a computer should only be made after careful study has been done of the financial and logistical pros and cons of such action and it has been discovered that computerizing will constitute a significant improvement over the present procedure.

By now you are probably asking "What will all this mean to me in my role as a teacher who uses computers?" Your contact with administrative uses of computers will probably come in one of two forms. First, as a school teacher, you invariably will be drawn into activities only tenuously associated with teaching. You may be called upon to coach a team, manage a club, or help take charge of Homecoming, for example. Each of these has some type of clerical work involved. Coaching can mean keeping statistics on team members and some accounting for money and equipment. Managing a club means keeping track of dues, at the very least, and somehow all the ballots for Homecoming Queen must be counted.

You may well decide that such clerical tasks might better or more easily be done by the computer. Second, as a resident "computer expert", you may be called upon to help decide whether or not a given administrative application should be computerized, or how it should be computerized. It is hoped that you will be able to make meaningful contributions to the debate, neither blindly urging computerization nor rejecting it out of hand, but helping to identify the advantages and disadvantages in order to reach a conclusion as to whether the expected benefits repay the investment of money, time, and effort.

This has been only a brief overview of a highly complex topic, but as mentioned at the onset, the objective is not to make you an expert but to make you aware. In keeping with this, you will find in Appendix A, a list of administrative computer applications in schools, keyed to a list of references (Appendix B) that you can use if you want to find out more about a particular application. The list is by no means complete but it is designed to show you the diversity that exists in this field. In Appendix A, there is a special section for payroll that outlines one expert's ideas of what is now and what could be done with a school payroll system. This shows the role that imagination (in thinking up new and useful applications) plays. It should be clear by now that just about any aspect of a school's administrative functions can be assigned to a computer but the important questions to answer are wheter it should be and if so how the computerizing should be designed. In all such designs, the user must be a focal point. The following list of criteria for a humanized information system (Sterling, 1975) provides a valuable guide for evaluating the extent to which such focus has been achieved.

STANLEY HOUSE CRITERIA FOR HUMANIZING COMPUTER SYSTEMS

Procedures for Dealing with Users

1) The language of a system should be easy to understand.
2) Transactions with a system should be courteous.
3) A system should be quick to react.
4) A system should respond quickly to users if it is unable to resolve its intended procedures.
5) A system should relieve the users of unnecessary chores.
6) A system should provide for human information interfaces.
7) A system should include provisions for corrections.
8) Management should be held responsible for mismanagement.

Procedures for Dealing with Exceptions

1) A system should recognize as much as possible that it deals with different classes of individuals.
2) A system should recognize that special conditions might occur that could require special actions by it.
3) A system must allow for alternatives in input and processing.
4) A system should give individual choices on how to deal with it.
5) A procedure must exist to override the system.

Action of the System with Respect to Information

1) There should be provisions to permit individuals to inspect information about themselves.
2) There should be provisions to correct errors.
3) There should be provisions for evaluating information stored in the system.
4) There should be provisions for individuals to add information that they consider important.
5) It should be made known in general what information is stored in systems and what use will be made of that information.

The Problem of Privacy

1) In the design of a system, all procedures should be evaluated with respect to both privacy and humanization requirements.
2) The decision to merge information from different files and systems should never occur automatically. Whenever information from one file is made available to another file, it should be examined first for its implications for privacy and humaniz tion.

Guidelines for System Design Having a Bearing on Ethics

1) A system should not trick or deceive.
2) A system should assist participants and users and not manipulate them.
3) A system should not eliminate opportunities for employment without a careful examination of consequences to other available jobs.
4) System designers should not participate in the creation or maintenance of secret data banks.
5) A system should treat with consideration all individuals who come in contact with it.

Sterling, Theodore D., "Humanizing Computerized Information Systems", Science, vol 190 no 4220, December, 1975, pp 1168-1172.

STUDY ACTIVITIES

1) The pricipal comes to you and asks, "Do you think we should computerize our report cards?" The school has no computer but has been offered the use of one belonging to a local business at $50 an hour. It is estimated that were the data to be punched on cards, the job could be done in 2 hours of computer time each grading quarter. Buying a program to process the cards would cost about $300. Doing report cards manually takes regular school personnel and one temporary office worker (at $175 per week) one week and mailing report cards to 500 students costs 15 cents per report card and 2 cents per envelope. The parents are complaining because it takes so long to get report cards and they would like the students to bring them home the last day of school. Computerizing might make this possible. How would you advise your principal?

2) A medium sized school uses a computer to perform a number of administrative tasks. At the beginning of each semester, class cards are punched out for each student, one for each course being taken. These cards have the student's name on them, as well as the course and teacher for each period during the day. They are arranged into decks by course and class period (i.e., there is an Algebra I, 3rd period deck; and American History, 4th period deck; and so on). Each teacher receives a deck of cards for each class he/she teaches. It contains a card for every student in that class. Every day, at the beginning of each period, the teacher pulls out the cards for those students who are absent and leaves them outside the classroom door. A student aid collects the cards and takes them to the attendance office where two clerks go through the cards write the names on the absence list for the day and update each student's permanent record to reflect the absence. The cards later are returned to the teachers. The two clerks do nothing but attendance bookkeeping and are paid about $8,000 per year each. Do you think this is a good way to perform attendance accounting? Can you suggest a way to improve the system?

3) Every year at your high school when Homecoming Queen is elected, there is a mad scramble to count the votes quickly. How would you computerize the voting procedure? What kinds of peripherals would best suit your purpose?

4) A large high school has difficulty with illegal parking in its parking lot and so issues parking tickets. The problem with these tickets, however, is that it is impossible for the clerical staff to process them fast enough and a steadily increasing backlog accumulates. The only way effectively to deal with the tickets is to computerize the process of identifying the owners of the guilty vehicles. In order to do this, certain information would need to be stored in a file in the computer and certain information would need to be recorded on the ticket itself. What information would be needed, both on the ticket and in the computer, to solve this problem? Describe briefly a process of identifying a hypothetical recipient of a parking ticket.

5) In vocational/technical education, comments by the teacher on report cards are more important, particularly for potential employers, than they are in academic curricula. A school wishing to computerize its student records faces the question of what to do with these comments, which must be retained for future reference but which lend themselves not at all to storage in a computer. How would you solve this problem so that comments could be stored conveniently and resurrected on demand? (Hint: you will need to find some way of standardizing comment format and making comments amenable to quantification. If you need help, see reference no 13 for one solution to the problem).

6) Choose one area of the outline of administrative computer uses at the end of this section. Read the references keyed to it and find four more articles on the topic to read. Prepare a set of recommendations of attributes a system for this area should have.

7) If such is available, examine a computerized attendance system and a computerized inventory system. Afterwards, write a list of the reports or answers to inquiries each package can give that would be useful to teachers and a list of forms of information that would be useful to principals. (Refer ISEAC no 9, a general information inventory system called INFO that may be used for this exercise)

8) If possible, talk with a secondary school teacher who has had experience with administrative applications of computers. Query them particularly about experiences and the role that creativity and imagination play in thinking up new and useful applications and implementing them with the administration's approval. Also, discuss with them real or potential roles that students might play in computerizing school activities.

APPENDIX A

ADMINISTRATIVE COMPUTER USES

A List of Administrative Computer Uses

I. Most common administrative computer applications.

A) Finance and Budget
1) Payroll (see reference 20)
a) Production of paychecks and payroll summary reports.
b) Management of Cumulative (year-to-date) tax, earnings, dues, pension, etc, information.
c) "Distribution of payroll" reports for budget accounting.
d) Production of W-2 forms and accompanying reports.
e) Reports for state, federal and local governments.
2) Accounts payable and receivable.
a) Production of purchase orders, reports and checks for same.
b) Production of bills, reports and follow-up for same.
c) Management of debtors', creditors' and general ledger postings for account transactions.
3) Budgeting
a) Reports on current budget status.
b) Reports on unexpected spending trends.
4) Miscellaneous accounting functions.
a) Listings of employee, vendor, and creditor files.
b) Reconciliation of one accounting branch with another. (for example, payroll and accounts payable with bank statement)

B) Personnel Reporting
1) Payroll (mentioned under finance and budget above).
2) Career information on teachers: education, previous experience, number of years in the district, grades and subjects taught, etc.
3) Vacation, leave or sick day status.

C) Student Reporting (see references 5,9,10,11,13,15,18)
1) Maintenance of up-to-date general information on students for student directory and mailing labels, etc.
2) Student history information maintenance (credits earned, courses taken, grades awarded, class rank, etc).
3) Attendance information for student report cards and state government agencies (funding purposes).
4) Grade report production.
5) Reports for analysis of student body sex and race make-up; honor roll and other special eligibility, class size, etc.

D) Scheduling (see references 2,7,8,14,24)
   1) Master schedule production.
      a) Assignment of course/teachers to classrooms.
      b) Assignment of students to courses.
      c) Management of conflicts.
   2) Students' and teachers' printed schedule production.
   3) Locker assignment.

II) Less common administrative applications of computers.

A) Finance and Budget.
   1) Breakdown of spending within budget areas by program.
   2) Cost analysis of projects and educational programs.
   3) Projections of future funding and costs for planning purposes.

B) Personnel reporting.
   1) Aids to salary negotiations (see reference 17).
      a) Negotiation simulations for instruction of administrators.
      b) Projections of suggested salary schedules for use during negotiations (see reference 15).
   2) Recruitment and substitute information.
      a) Maintenance of applicant files containing information supplied by applicants, recommendations, interview ratings, etc.
      b) Maintenance of substitute files containing relevant information.

C) Student reporting.
   1) Maintenance of post-graduation information on students for college admissions and job market analysis.
   2) Drop-out analysis.
   3) Correlations capability to enable trends to be observed in grade vs attendance, teachers' experience vs grades earned by students, etc.

D) Inventory management.
   1) Maintenance of up-to-date file of stock on hand.
   2) Production of orders for supplies.

E) Library management.
   1) Catalogue file maintenance.
   2) Overdue books report production.
   3) Unpaid fines report production.
   4) Management of information on borrowed books and production of overdue notices.

F) Audio-Visual Functions.
   1) Control of reservations for films and equipment.
   2) Maintenance of equipment and media file containing purchase information, history of use, present location of item, etc.

G) Bus scheduling: analysis of students' and drivers' addresses. Production of suitable routes to provide the most efficient and inexpensive transportation.

H) Facility use and planning (see reference 21).
   1) Maintenance of up-to-date schedule of uses of rooms.
   2) Schedule requests for one-time uses of facilities.
   3) Usage analysis report production.

I) Miscellaneous Applications.
   1) Cafeteria inventory control
   2) Maintenance of building and equipment.
   3) Counselling information.

LIST OF PAYROLL RELATED DATA PROCESSING ACTIVITIES

Timekeeping and Attendance

Time reporting: regular, overtime, adjustments
Time card labels
Special categories: absences with pay, without pay, etc.

Labor Distribution

Labor distribution coding system
Job and project costing
Intra-organizational transfer: allocated costs
Distribution by shift, position, function, etc.

Gross to Net Calculations

Tax calculations: Federal, FICA, state, county, city, etc.
No tax feature for eligible employees; multiple stored rates.
Percent of gross deductions.
Required minimum gross deductions.
Recirculating deductions (bonds); installment payments.
Deductions which skip pay periods or automatically expire.
Payroll advances.
Tax sheltered annuities.

Special Payments

Sick pay, vacation pay, housing allowances, annuities, special time requests.
Incentive guarantees, bonuses, profit-sharing, etc.
Manual checks and cash disbursements.
Piecework wages.
Tuition refund plans.
Family court and garnishment payments.
Refund checks.
Non-standard pay periods, weekly, bi-weekly, semi-monthly, etc.
Automatic savings and checking account deposits.

Routine Payroll Reports

Payroll checks and stubs: variable check formats.
Tax reports: W-2 forms, Quarterly 941A, 1099, etc.
Workmen's compensation reports
Payroll check register and deduction reports
Bank and account reconciliation reports
Fringe benefit reports: life insurance, health insurance, pension, profit-sharing, etc.
Accrual of leave liabilities

Financial Management

Organizational and departmental summaries
Fiscal and calendar summaries
Position and force level control; vacancy reports.
Exception and ad hoc reports
Quarterly/annual budget reports
Cost center and project profitability reports
Interface with other administrative systems: personnel, accounting, etc.

Personnel Management

Attendance and absenteeism analysis
Savings bond participation reports
EEOC reports (equal opportunity)
Report of eligible employees for position openings or promotion exams
New employee record production
Union and seniority reports; vacation qualifications
Employee health and insurance claims; safety statistics
Actuarial calculations
Skill inventories
Job position histories
Employee directories and mailing lists
Personnel travel costs

APPENDIX B

ADMINISTRATIVE COMPUTING REFERENCES

BIBLIOGRAPHY AND REFERENCES

1) Adams, H., "Personalizing the Process: On-Line Registration", Community and Junior College Journal, vol 44, June 1974.

2) Alspaugh, J.W. and Harting, R.D., "Computerized Scheduling", School and Community, vol 60, April 1974.

3) Boardman, G.R., et al, "Some Basic Concepts of Educational Information Systems", Educational Technology, vol 12, June, 1972.

4) Bridger, J.A., "Teacher Evaluation with a Computerized Student Opinionaire", Improving College and University Teaching, vol 21, Winter, 1973.

5) Campbell, G.M. and Jansson, L.C., "Computer Costs and Capabilities for Instruction and Administration", National Association of Secondary School Principals Bulletin, vol 58, March, 1974.

6) Castellan, N.J., "GRADER: An Automated Gradebook System", Educational Technology, vol 13, April, 1973.

7) Davies, T.I., "School Time-Tabling by Computer", Trends in Education, vol 35, October, 1974.

8) Heller, R.W., et al, "Two Computer-Based School Scheduling Programs Analysed", National Association of Secondary School Pricipals Bulletin, vol 58, March, 1974.

9) Howe, R.L., CEIS: Does the Foundation for a Nationwide Information System for Education Already Exist?", Journal of Educational Data Processing, vol 11 no 1, 1974.

10) Keller, R.E., et al, "From Admission to Archives---", College and University, vol 49, Summer, 1974.

11) Kendig, W.L., "Providing Accurate Student Data", College Management, vol 9, March, 1974.

12) Mickey, M., "Moving from Manual to Machine Operation, College and University, vol 49, Summer, 1974.

13) Mulski, J.H. and Levy, M., "When a Computer Fills Out Students' Report Cards", Industrial Education, vol 61, October, 1972.

14) Oyard, G.F., "Daily Computer Scheduling", National Association of Secondary School Principals Bulletin, vol 58, March, 1974.

15) Patterson, J.E., et al, "Computerized Report Cards", Educational Technology, vol 16, August, 1976.

16) Sargent, G.F., Bell, N.T. and Bristol, J.L., "A Case for 'CASE': Computer Assisted Salary Schedule Evaluation", paper delivered at AEDS Convention, 1976.

17) Spuck, D.W. and McIsaac, D.N., "Computer Program to Provide Instant Help in Salary Negotiations", Educational Technology, vol 14, May 1944.

18) Starkweather, W.C., "Consideration of a Cumulative Computerized Permanent Academic Record File", College and University, vol 49, Winter, 1974.

19) Sullivan, G., "Form-alizing Faculty Reporting System", College and University Business, vol 56, June, 1976.

20) Susswein, H., "Make Your Payroll System Work Harder", School Management, vol 18, February, 1974.

21) Tufts, R.B., "Room Assignment and Conflict Report: A Tool for Room Scheduling, Assignment and Planning", College and University, vol 51, Fall, 1975.

22) White, B.F. and Abbott, M.L., "Evaluation and Selection of a Data Base Management System", Journal of Educational Data Processing, vol 11, 1974.

23) Willey, L.V., "Nine Ways for Small and Middle-Sized School Districts to Make Computers Pay Off", American School Board Journal, vol 160, August, 1973.

24) Wright, J.F., et al, "Class Schedule and the Computer", College and University, vol 49, Summer 1974.

BOOK

Tidwell, S.B., Public School Fund Accounting: Priciples and Procedures, Harper, New York, 1960.